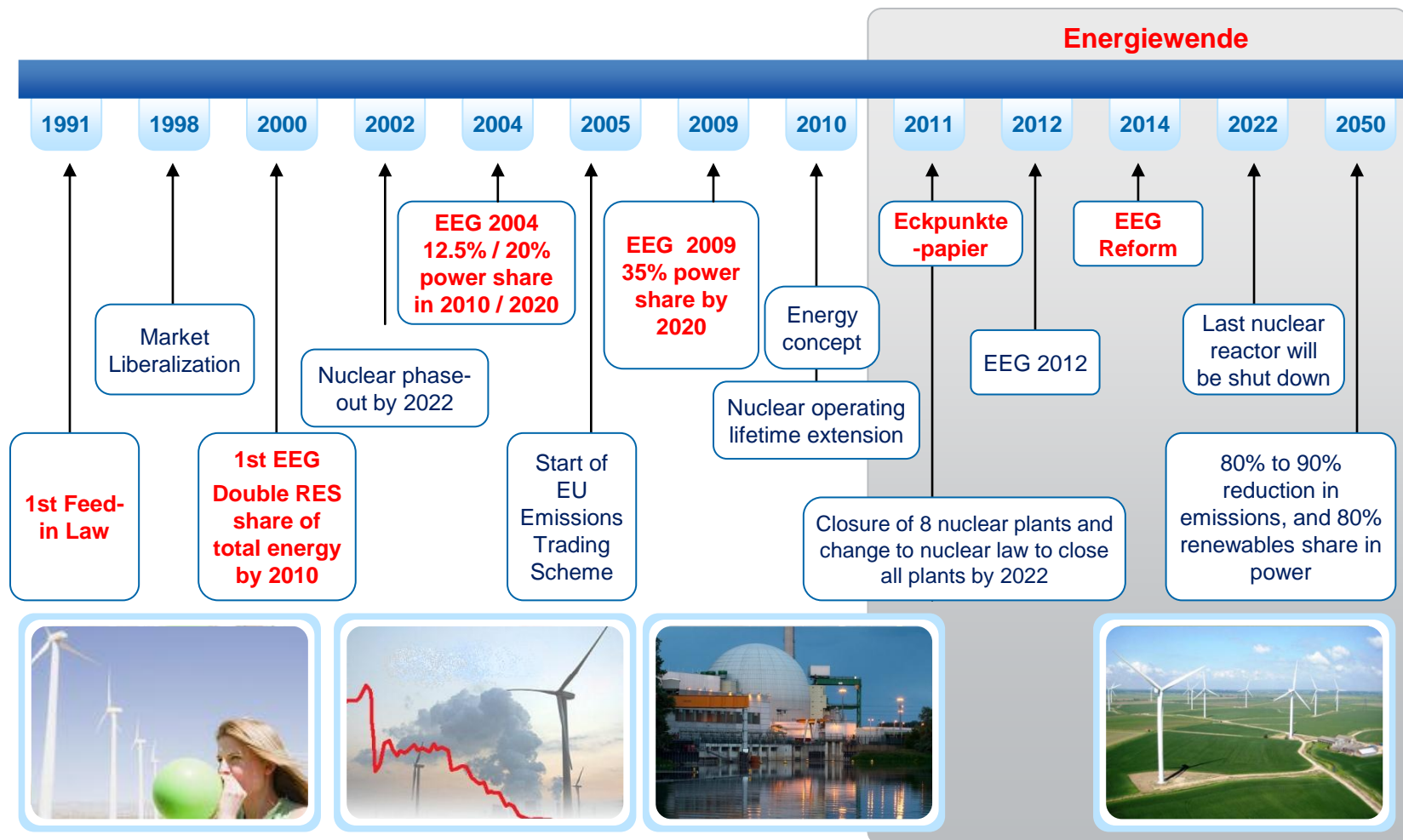


# The German Energiewende

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Californian PUC Thought Leaders Meeting  
5<sup>th</sup> June 2014



# The Energiewende – a plan to move from nuclear and coal to renewables: milestones from 1991



# Further targets introduced in 2011...

Firm goals		2020	2030	Instruments <sup>1</sup>
K1	Phase out nuclear power by 2022			2011 Nuclear Power Law
C0	Reduce greenhouse gas emissions compared to 1990 by	40%	55%	ETS with German version
C1	Increase proportion of renewables (RES) in gross final energy consumption to	18%	30%	Renewable heating, and Biomass laws,
C2	Increase the proportion of RES in gross elec. consumption to	35%	50%	EEG
C3	Reduce primary energy consumption compared to 2008 to	20%	-	Environmental tax, EnEV
C4	Reduce electricity consumption compared to 2008 by	10%	-	Environmental tax
C5	Increase energy efficiency compared to 2007 by	20%	-	Environmental tax and other laws
C6	Reduce heat demand of buildings compared to 2008 by	20%	-	EnEV
C7	Increase number of electric vehicles to	1 Mio.	6 Mio.	Energy and climate funds
C8	Reduce final energy consumption in transport vs.2008 by	10%	-	Reform car tax
N1	Grid expansion according to ENLAG	-	-	EnLAG
N2	Punctuality of the grid connection of offshore wind farms	-	-	EnWG
N3	Increase installed capacity of offshore wind to	10 GW	25 GW	EEG
V1	Supply security	-	-	Strategic Reserve
W1	Limit renewables surcharge to 3.5 cents/kWh			Not available
Currently only loosely defined goals				
C	Reduce heat demand of buildings compared to 2008	-	-	EnEV
C	Annual rate of energy-saving renovation in housing of 2%	-	-	Only indirect – loan programme
V	Additional construction of firm fossil fuel power plant capacity	10 GW	-	Not available

# ... which were off track after just two years, except for renewables growth

## Sustainability

1. Achievement of federal government's CO<sub>2</sub> reduction target (-40 %) increasingly unrealistic
2. Share of renewables rising in the case of electricity – stagnation in the transport and heating sectors
3. Due to first results from coalition talks the watering down of heating efficiency targets is likely



78%

## Grid expansion

1. More than 80% of expansion projects still delayed
2. By 2015 a number of offshore wind farms will be completed, but key grid expansion projects for overland transmission of electricity will not be ready until that time
3. At least there is some improvement in sight for offshore wind power connections to the grid



15%

## Costs/EEG levy

1. With 6.2 ct /kwh the EEG levy has exceeded the government's own threshold of 3.5 ct / kWh by far
2. With the new government at least modest reforms that are targeting at limiting the costs are to expect, so we come to an neutral outlook for the next years, but situation will not improve quickly



22%

## Security of supply

1. Increasing intervention by transmission system operators in the market to avoid critical situations with the power grid. The situation continued in whole 2013.
2. End of March 2013 there were some severe situations in the German grid due to very high wind feed-in.



50%



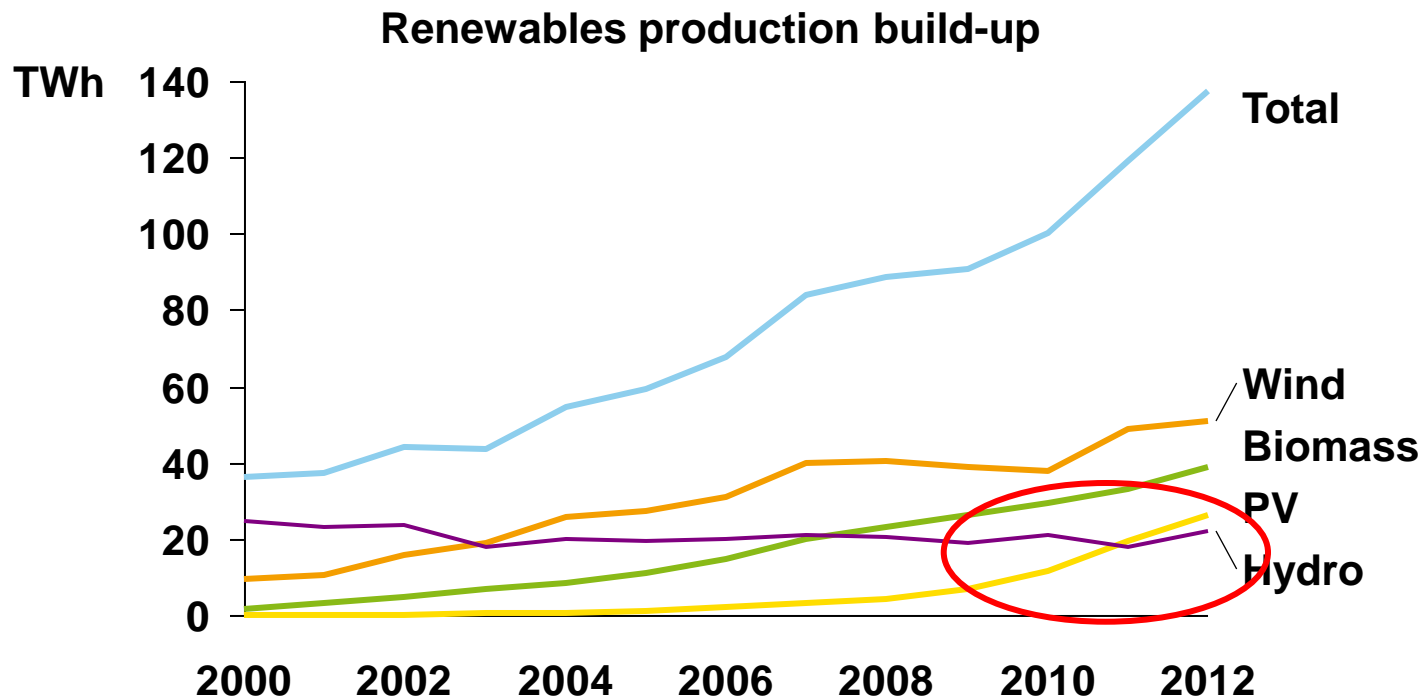
Adherence to target path:

= 41%

Source: own calculations

**VORWEG GEHEN**

# The result of a renewables subsidy scheme without a cap

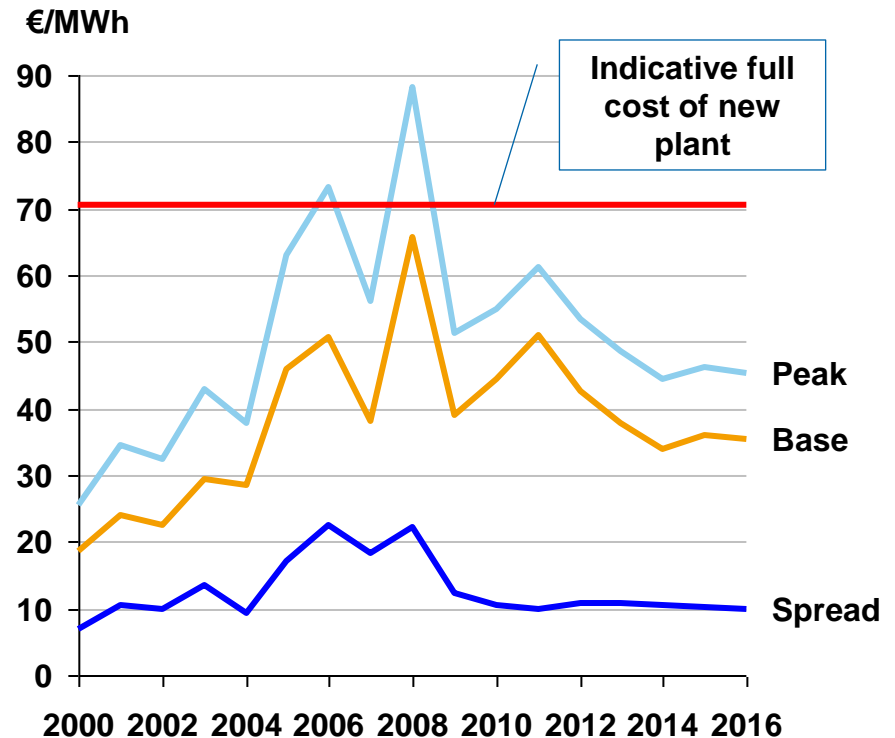


- Costs (esp. PV) continually lower than subsidies = strong incentive to build
- Growth could not reasonably have been anticipated before 2007
- Annual support originally expected to be € 0,6 bn, not € 22 bn p.a.

# Wholesale price was cut by 50% vs. expected level...

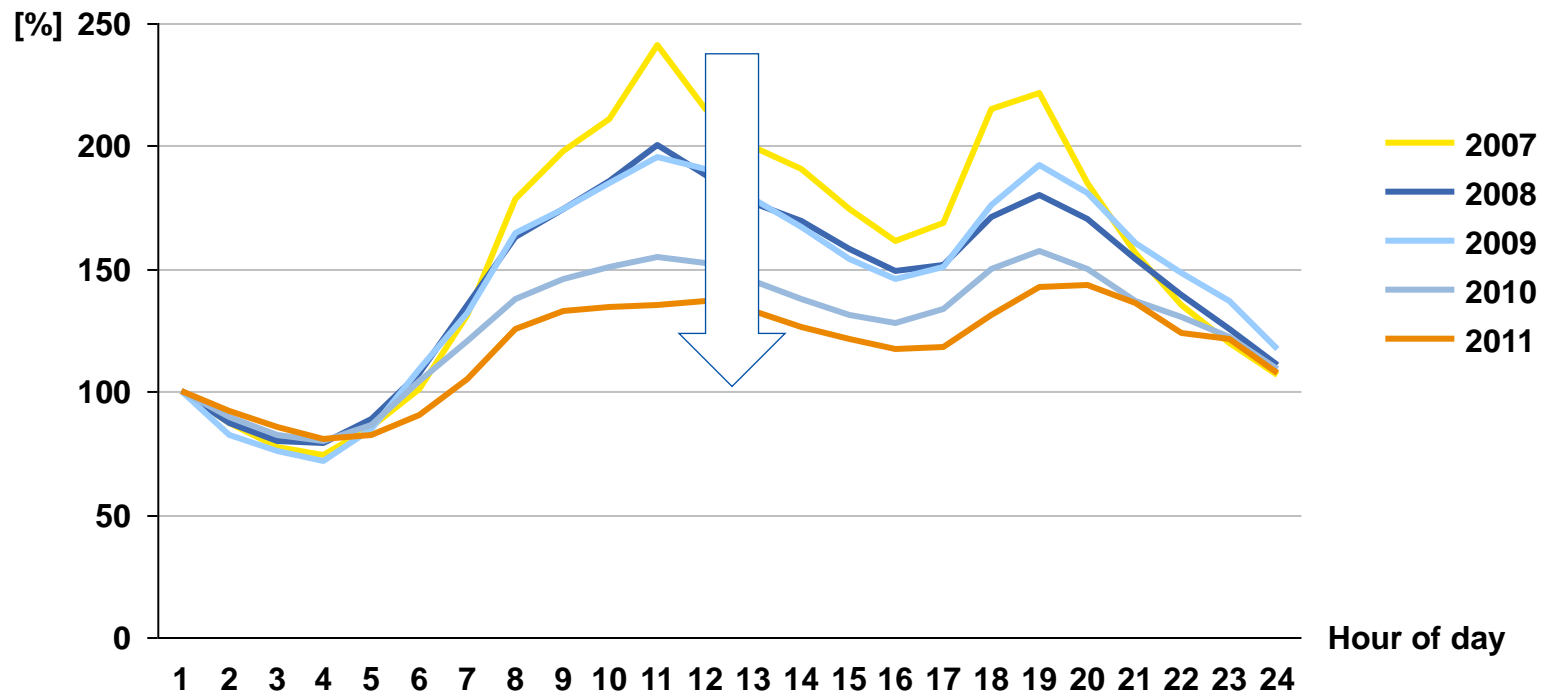
1. Volume effect of higher than expected RES also pushed out merit-order curve
2. Volume effect of recession reduced clearing price in merit-order curve
3. PV had effect of flattening out daily peak price – important part of earning component
4. Low CO<sub>2</sub> price
5. Low coal price– flattened out merit-order curve

German power prices

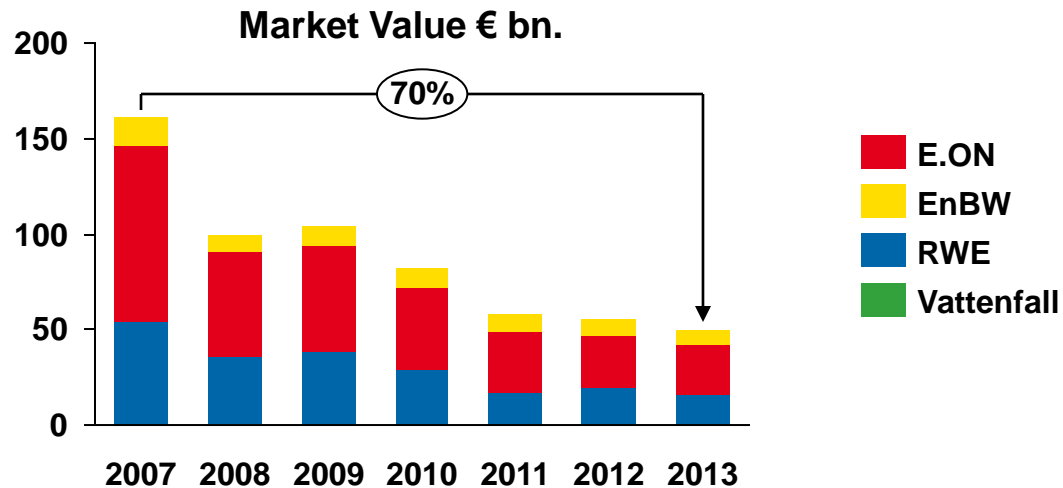
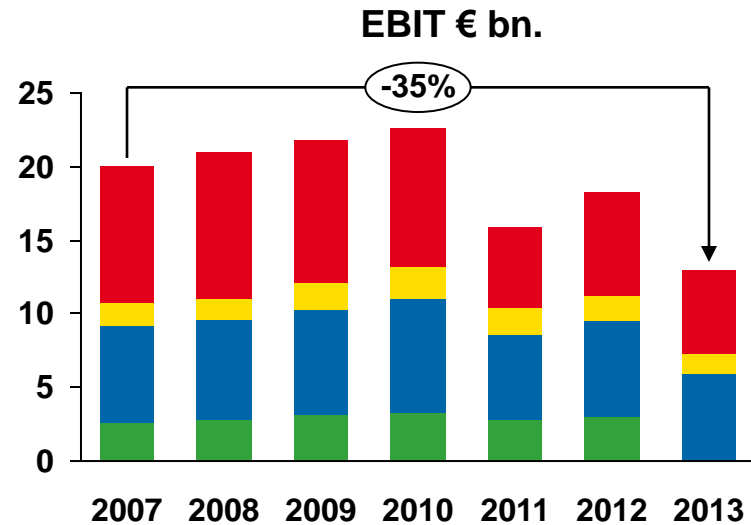
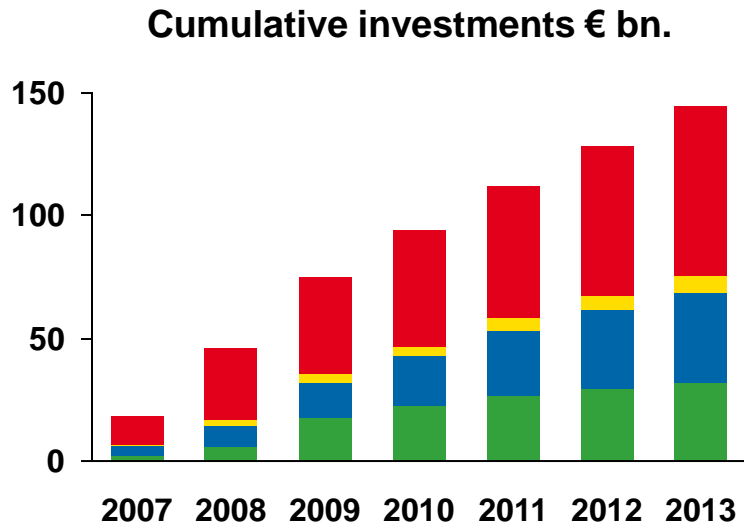


... due in part to the high PV level depressing mid-day prices radically...

Progressive reduction of mid-day price through PV-generation



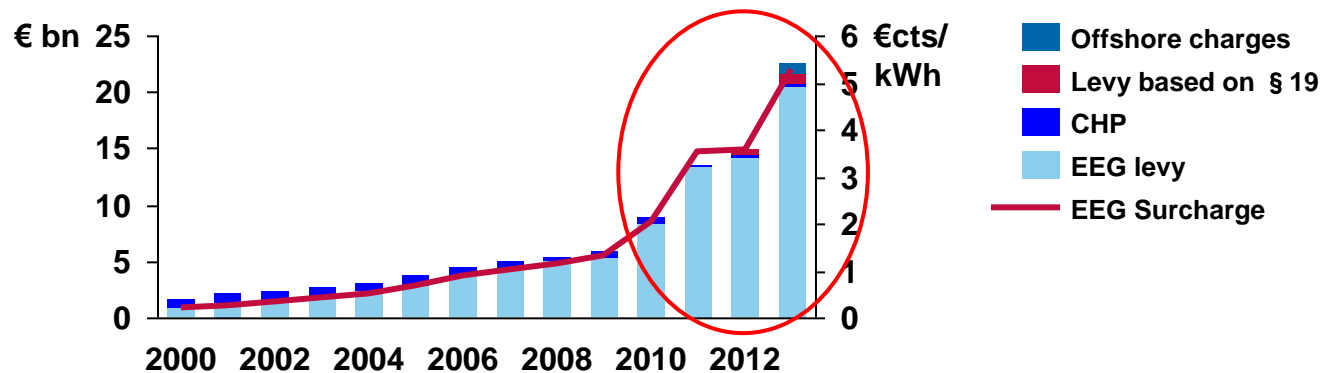
# ... leaving utilities in a very poor financial position



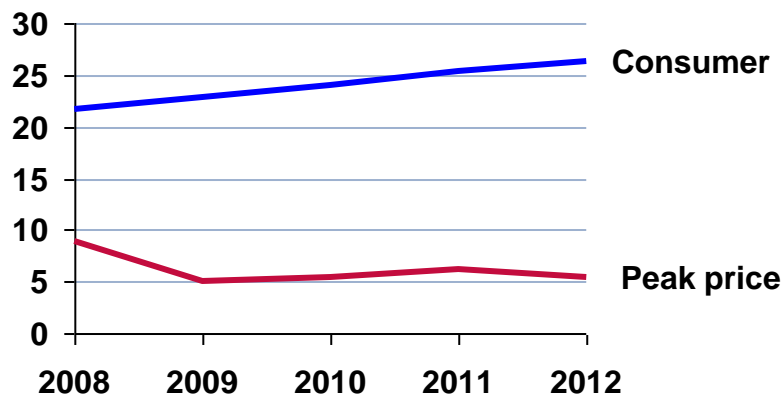


# The Consumer Price has been driven up by the surcharge despite a falling wholesale price

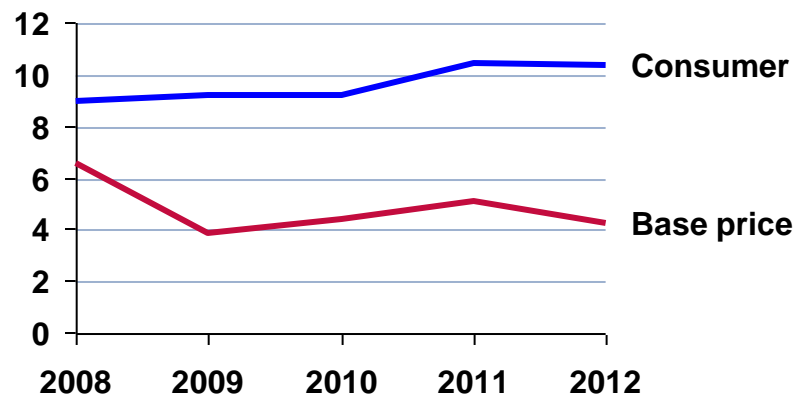
EEG Subsidies and Consumer Price Surcharge



Power prices for households  
(2.5-5 MWh) €ct/kWh incl. all taxes



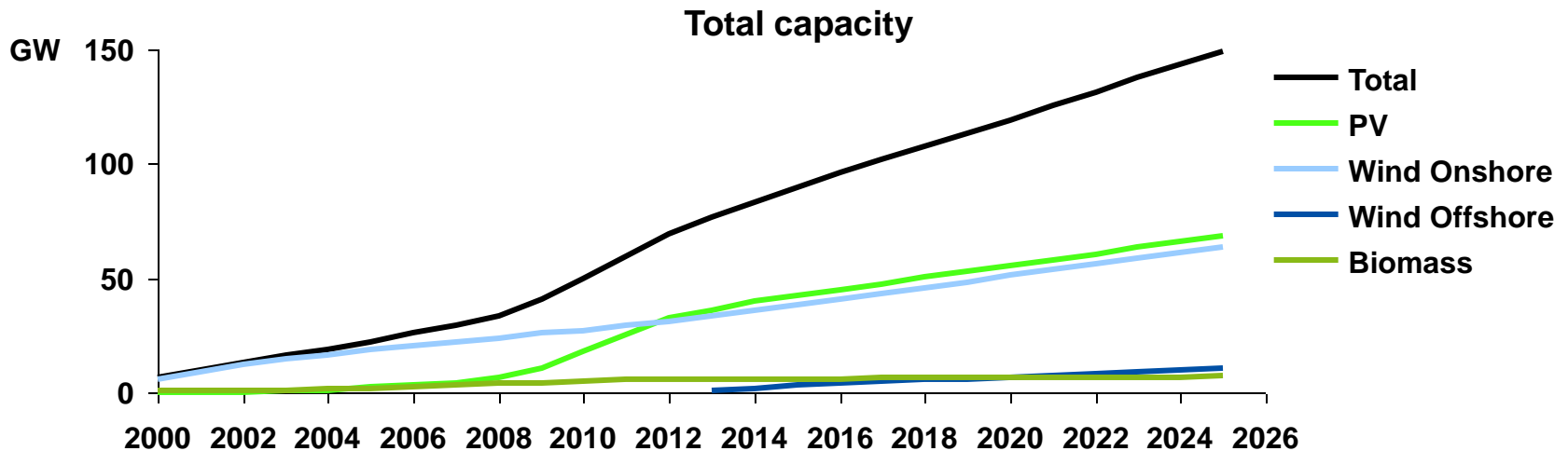
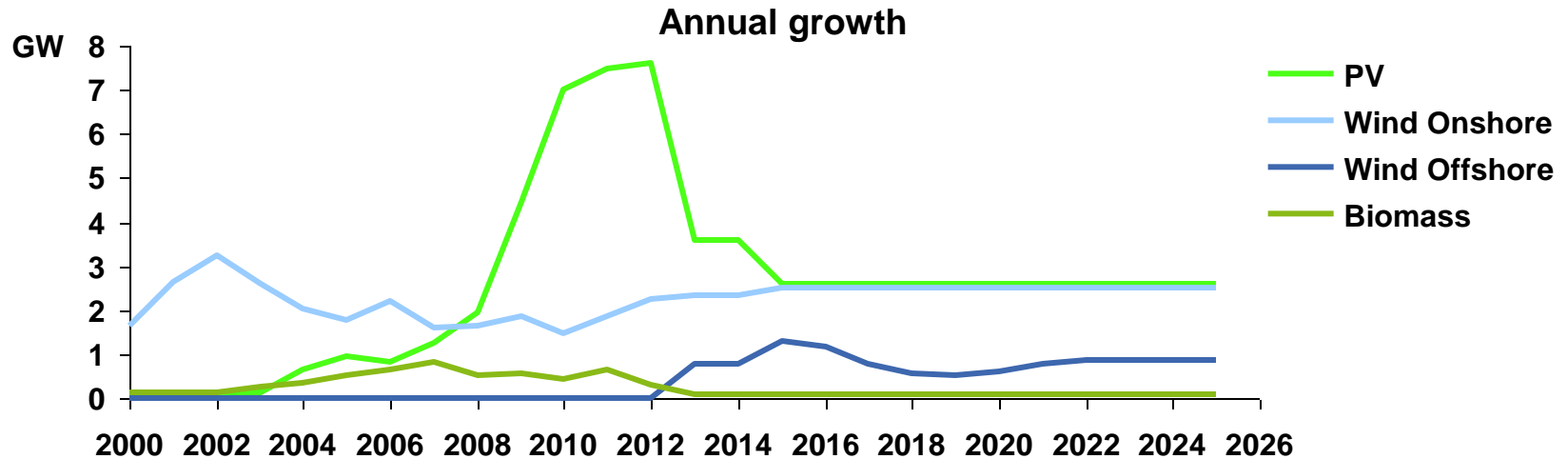
Power prices for industrial consumers  
(20-70 GWh) €ct/kWh excl. VAT



# The EEG is being revised to maintain ambitious targets but control the costs

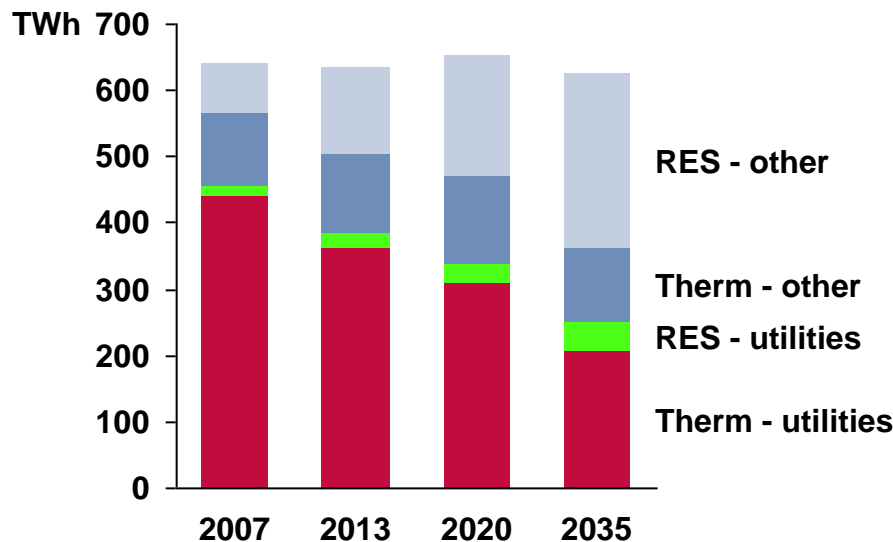
- **Aim to reach 40-45% by 2025 then 55-60% by 2035 renewables share of power but always ensuring affordability and supply security**
- **Reduce average RES cost level from €cts 17 / kWh to €cts 12 / kWh**
- **RES growth corridor will be legally fixed**, with technology-specific instruments and focus on the most cost-efficient technologies
  - Onshore wind and PV each a maximum growth of 2.5 GW p.a. (excluding repowering), with appropriate tariff adjustment
  - Offshore wind 6.5 GW to 2020 and 15 GW to 2030 and afterwards 2 wind-parks p.a.
  - Biomass maximum 100 MW p.a. (considered too expensive for more)
- **Improved market integration** with market-premium approach and direct marketing
- **New EEG (renewables law) will be fully EU-conform, including industry privileges**
- **Market design** – a capacity market is envisaged medium-term
- **Time-plan** – Parliamentary process underway with aim of entry in law on 1<sup>st</sup> Aug. 2014

# Renewables growth path proposed by new EEG compared with past

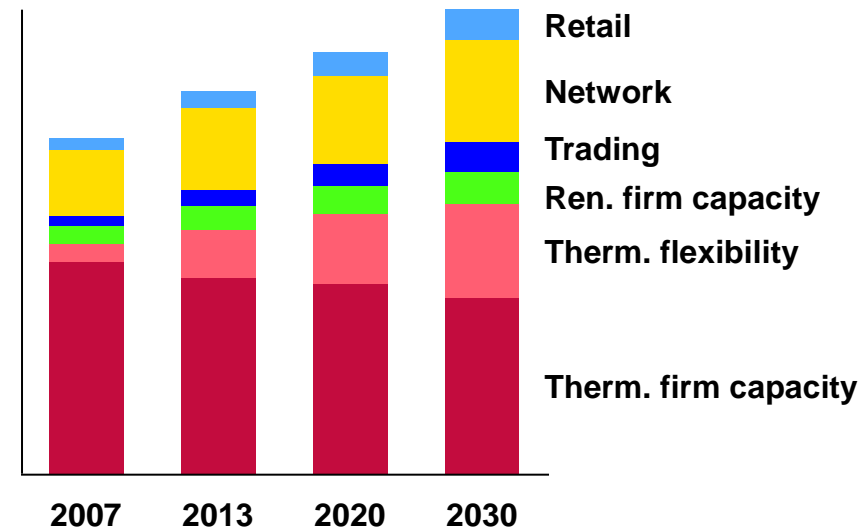


# Utilities business model shifts from conventional production to some renewables and even higher emphasis on service

Less conventional production  
(indicative figures)\*



More effort on service  
Qualitative Index vs. 2007



RES. = renewables,  
Therm. = conventional thermal plants

# Conclusions

- Nuclear power will be shut-down by 2023 – no turning back
- The renewables growth plans remain very ambitious:  
55-60% share of power generation by 2035
  - Cost to household and medium-sized industry being brought under control; large industry has various exemptions
  - High consumer prices will hinder electricity from playing a wider role in decarbonisation
  - Need to increase transmission capacity between North and South of country remains a key challenge
  - Technical challenges in integrating renewables remain
- Supply system continues to deviate further from market basis
  - Wholesale price signals only serve for plant dispatching
  - Regulatory risk remains very high
- Conventional utilities can't replace lost thermal revenue

